BAINBRIDGE ISLAND REVIEW

▾ *Island researcher leads satellite-based study of salinity's effect on climate.*

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Photo by Ryan Schierling/Banbridge Island Review

(Above) Islander Dr. Gary Lagerloef was recently named the principal investigator for Aquarius, a satellite-based survey of earth's oceans that's set to launch in 2008. (Inset, courtesy of NASA/Goddard) An artist's rendering of Aquarius as it will look when deployed in orbit. The trio of cone-shaped radiometers will scan the earth's surface using passive microwave radiometry, generating a complete map of the ocean's sea surface salinity every eight days. For more information about the Aquarius mission, visit ESR's website at www.esr.org.

It's still T-minus four years until blast-off, and the cozy Parfitt Way offices of Earth and Space Research are far from launch control.

But a squall rattling the windows is a reminder that, while the Aquarius space mission may be years away, the realm of ESR's research is close by.

"(The year) 2008 is a long way away, but the time seems to go by quickly. There's a lot to do," said ESR president and oceanographer Gary Lagerloef.

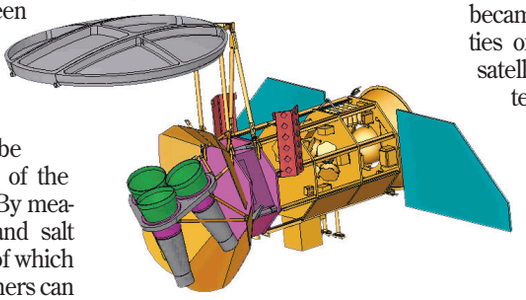
Early this year, the Bainbridge resident was named principal investigator for Aquarius/SAC-D, a near-earth satellite mission that will provide the first comprehensive measurements of a fundamental component of global climate: salt.

Aquarius' three-year survey of seawater salinity will help link two critical mechanisms of climate change that have long been studied separately.

Ocean circulation – in which solar energy absorbed by seawater travels around the globe – is a major determinant of the world's weather patterns. By measuring the temperature and salt content of seawater, both of which affect density, oceanographers can determine how that water moves.

That salt content, in turn, is affected by the "water cycle," in which water moves through the environment. Most of that activity occurs over the world's oceans; climatologists estimate that 86 percent of evaporation and 78 percent of precipitation occurs at sea – diluting or concentrating the salt at sea level, which helps drive ocean circulation.

A better understanding of the interaction between the water cycle and ocean circulation promises a significant payoff: vastly improved models of the Earth's climate system, making it possible to forecast damaging events like El Niño six to 12 months sooner.



Sea sound

As it brings together two dynamos of climate change, the Aquarius mission will unite two of Lagerloef's longtime interests: sea and space.

"I was glued to my TV every time there was a Mercury, Gemini or Apollo mission," he admits.

After launching his career as a coastal oceanographer, Lagerloef became engaged in the possibilities of "remote sensing" – using satellites to study Earth's systems, including the ocean – in the late 1980s during a stint at NASA.

Satellite remote sensing "just drew me like a magnet," he said.

"You have to push the boundaries of science and technology."

While direct sampling produces accurate measurements of salt content, it's never been possible to cover enough of the world's oceans to get a complete picture.

"Almost all of the information has been collected by ships, and that's been largely confined to shipping routes," Lagerloef said. "Most of the southern hemisphere hasn't been sampled at all."

To measure salinity from orbit, Aquarius relies on "passive microwave radiometry," which systematically scans the ocean surface for "noise" on a specific frequency, noise that's determined by the amount of salt in the water.

While the technique doesn't allow for pinpoint measurements, the comprehensiveness and frequency of the coverage represents a huge step forward for climate science. Aquarius will measure the entirety of the ocean surface every eight days for three years, and explore regions of the world's oceans never before measured.

"It's every scientist's dream to be involved in discovery," Lagerloef said. "I'm sure we'll be surprised by what we find."

New ground

The scientific institute that's supporting the mission, Earth and Space Research, is itself an exploration of new territory.

Not affiliated with an academic

or governmental institution, and not beholden to the private sector, ESR occupies a new niche for scientists searching to make money and fund research, Lagerloef says.

While working at a California-based research and engineering firm in the mid-'90s, he and fellow oceanographer Robin Muench began looking for alternatives to the product-oriented projects that drive private-sector science.

"We found our interests were in basic research," Lagerloef said. "The purpose of forming ESR was to provide us with a base to do that research.

"We are pioneering this a little bit."

Founded in Seattle in 1995, Earth and Space Research has since grown to eight scientists and two administrative staff, with satellite offices – home base to their affiliate researchers – in Seattle, New York, Oregon and Bainbridge.

Under the guidance of islander Karen Haig, business manager, the group is committed to staying "small and non-bureaucratic." Operations are supported by government grants that fund research in the environmental sciences, with projects ranging from sea surface salinity to tidal activity in the polar oceans.

While the institute is a haven for basic science, the research couples intellectual curiosity with a concern for direct public benefit, Lagerloef says.

"We *live* on this planet," he said. "All of us feel strongly that we want our work to have relevance to the public and not just let it collect dust somewhere in a scientific journal."

That's partly a practical concern; one of the mandates in accepting federal funding is to foster public awareness of the project, especially with children.

"We really want to communicate the wonder of science to kids," said Camisa Carlson, ESR's outreach coordinator.

That wonder is just as relevant for adults, says Lagerloef, who has seen interest in environmental science rise in recent years.

"There is a real thirst, hunger for information about climate change," he said. "The question I most frequently get asked is, 'So when's the next El Niño?'"

"For the first time, the effect humans are having on the planet impacts our own civilization."

Dr. Gary Lagerloef

Understanding the science behind environmental change is central to an increased awareness of human interaction with the planet, including global warming.

"Most of the time when I show the graphs about (long-term climate trends) people's eyes pop," he said. "The more well-informed people are, the more well-informed choices they make."

Lagerloef says that, over the years, he has directed his own choices toward reducing his "footprint" on the environment. He regularly bikes to his Seattle office, and his family drives a gas/electric hybrid car.

"I started taking an inventory of what my own impact is on the planet."

And while the oceanographer is convinced of Earth's ultimate longevity – it has, after all, supported life for millions of years – the shorter-term fate of our own species is less certain.

"For the first time, the effect humans are having on the planet impacts our own civilization," he said.

"What it means for that civilization is very much in our own hands."

IN OUR OPINION

Plumbing the depths of our 'new ocean'

EDITORIAL

Sometimes it is a good idea to look back at where we've been – even when what we can expect to see is a pillar of salt.

The Aquarius mission, described elsewhere in these pages, is a reminder that a good deal of scientific discovery lies in the renewed examination of the familiar. In the case of the mission that islander Gary Lagerloef sends skyward in 2008, the salinity of our planet's oceans – a critical contributor to Earth's climate, well known but sparsely measured – will be mapped for the first time, in just eight days.

That's a treasure trove of information, and it's made possible by one of NASA's most overlooked extraterrestrial enterprises: unmanned, near-earth scientific study. When most of us picture the explorers of space, we see the human faces – Shepard, Grissom and Glenn, and more recently, the crews of Challenger and Columbia; or else we imagine the robotic wonders of the Mars missions, which probe with seeming sentience a fascinatingly inhospitable world.

What we don't picture are the workhorses of our orbital fleet – the hundreds of scientific and communication satellites that have, since the launch of Sputnik, expanded our reach to the furthest imagined corners of the planet. We forget to see them as explorers, and Earth as a strange new world still to explore.

Nowhere is that strangeness more palpable than in our planet's oceans. Remarkably, the bulk of the world's surface is, in some ways, as alien as the Martian landscape we are currently mining for signs of water. The oceans are a hotbed of research into the extremes of life – marine worlds that survive below polar ice and in the boiling-acid environment of deep-sea fumeroles. And, as the recent sequencing of 1.2 million genes in a bucketful of water from the Sargasso Sea (the entire human genome runs to a mere 30,000) testifies, that life is still mostly unknown.

In his 1962 speech at Rice University, President John F. Kennedy called space our "new ocean," a frontier that would "serve to organize and measure the best of our energies and skills." For the generation or two that grew up thinking of 'Enterprise' and 'Beagle' as names of spacecraft, not of ships, it may be equally true that the oceans are our "new space," where scientists pilot the missions and test the waters.

As islanders, we may better appreciate – or more easily take for granted – our dependence on those waters. Here, as elsewhere, water supplies – ultimately inseparable from the health of our marine environment – are the subject of increasing study, and concern. Water was the focus of a recent issue of Yes Magazine, and the theme for the ABC/BILT environmental conference on March 20. It is also at the heart of the city's ongoing update of its Critical Areas Ordinance, a body of regulations mostly devoted to water quality issues.

The inquiry enabled by Aquarius is grounded in these concerns, and in the need to balance our short-term life requirements with the long-term health of the ecosystem. To repeat Lagerloef's dictum, "we *live* on this planet."

While this well-meaning spirit cannot remove the possibility that scientific data will become the tool of right- or left-wing social agendas, perhaps it can defeat the skepticism with which the concept of "best available science" is often viewed.

In December 1968, Frank Borman, Jim Lovell and Bill Anders, the crew of Apollo 8, became the first humans to see the crescent Earth rise over the lunar landscape. Those of us living in this age of Aquarius may look back to the science of our time as the moment we truly took stock of what makes the Earth, our only home, sparkle like a blue jewel among the planets.